December 20, 2000

DECLARATION

The undersigned, Jan McLin Clayberg, having an office at 5316 Little Falls Road, Arlington, VA 22207-1522, hereby states that she is well acquainted with both the English and German languages and that the attached is a true translation to the best of her knowledge and ability of a priority document, German docket number R. 33331, of BIEBER, K., et al., entitled "HAND-GUIDED DRILLING OR IMPACT DRILLING MACHINE".

The undersigned further declares that the above statement is true; and further, that this statement was made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or document or any patent resulting therefrom.

Jan McLin Clayberg

HAND-GUIDED DRILLING OR IMPACT DRILLING MACHINE

Prior Art

The invention is based on a hand-guided drilling or impact drilling machine as generically defined by the preamble to claim 1. A drilling machine is already known (German Patent Disclosure DE-A 43 05 965) that is provided with a locking device by means of which a drill spindle can be locked in a manner fixed against relative rotation relative to a housing of the manual machine tool, so that a drill chuck screwed to the drill spindle can be loosened from the drill spindle, and/or a tool can be fastened in the drill chuck without using a wrench. The known drilling machine has the disadvantage that the spindle locking must be tripped by hand by pressing on a push button. This presents the user with the problem of holding the tool or drill chuck with one hand and the drilling machine with the other and in addition still tripping the spindle locking. Furthermore, the presence of a safety device that prevents unintended tripping of the spindle locking while the drill spindle is rotating is also required.

From US Patent 5,016,591, a battery-operated rod-type screwdriver is known, in which a locking coupling is provided between an output shaft of a planetary gear and a hexagonal screwing tool socket; the locking coupling makes it possible to use the rod-type screwdriver as a manual screwdriver. The hexagonal socket cannot be removed from the output shaft, nor can a torque be withstood upon a tool change.

Advantages of the Invention

The drilling or impact drilling machine according to the invention as defined by the characteristics of claim 1 has the advantage that tools can be fastened in the tool socket without difficulty and without using a wrench, and the drill chuck can be equally easily loosened from the drill spindle, since the drill spindle then automatically locks in each case. Separate actuation by the user to lock the drill spindle is unnecessary. Additional safety devices to prevent the rotation locking while the drill spindle is in rotation are superfluous. The drilling or impact drilling machine of the invention is both simple in structure and easy to use.

By the provisions recited in the dependent claims, advantageous refinements of and improvements to the drilling or impact drilling machine of the invention are possible.

It is especially advantageous to dispose the locking device on an intermediate shaft, because then the axial impact motion of the drill spindle has no disruptive influence on the locking of the drill spindle.

It is also advantageous if the intermediate shaft and the drill spindle are coupled via a gear connection with a negative gear ratio, because then, especially when the tool holder is screwed on or unscrewed, peak torques to be withstood are effectively reduced.

An especially simple design of the locking device

can be attained by embodying coupling claws of the locking coupling on a gear wheel.

By disposing the gear wheel and a slaving disk on the same shaft, component tolerances can be reduced, thus assuring especially reliable locking.

Drawing

One exemplary embodiment of the invention is shown in the drawing and explained in further detail in the ensuing description. Fig. 1 shows a longitudinal section through the front part of an impact drilling machine, Fig. 2 is a section taken along the line II-II of Fig. 1, and Fig. 3 is a section taken along the line III-III in Fig. 2.

Description of the Exemplary Embodiment

In Fig. 1, reference numeral 10 indicates an impact drilling machine, which has a drive motor 11 for driving a tool holder 12 to rotate. The drive motor 11 is accommodated in a machine housing 26 and is in geared connection with a drill spindle 13, to which the tool holder 12 is screwed via a thread 35. The drive motor 11 has a motor shaft 14, which is provided with a drive pinion 15 on its end. The drive pinion 15 meshes with a gear wheel 16, shown in Fig. 2, that is rotatably supported on an intermediate shaft 17. The intermediate shaft 17 has sets of teeth 18, 19, which are fixed against relative rotation and mesh with gear wheels 20, 21, which are supported rotatably on the drill spindle 13. The gear wheels 20, 21 can be connected alternatively to the drill spindle 13 in a manner fixed

against relative rotation by means of a traction wedge 23 that is axially displaceable in a longitudinal groove 22 of the drill spindle. The traction wedge 23, together with the gear wheels 20, 21 and an actuating device, not shown, forms a manual transmission 24 with two speeds. A first speed (slow rpm) is formed by the tooth pairing 18, 20, and a second speed (fast rpm) is formed by the tooth pairing 19, 21. The gear ratio of the gear stages 18, 20 and 19, 21 is negative; that is, a speed change to a slower speed takes place from the intermediate shaft 17 to the drill spindle 13.

A detent impact mechanism 28 is seated on an end of the drill spindle 13 remote from the tool holder 12; by means of this mechanism, axial impacts can be exerted on the drill spindle 13 in the known manner. The detent impact mechanism 28 can be switched off in the usual way, so that the impact drilling machine 10 can also be used as a drilling machine with two speeds.

The tool holder 12 is embodied as a jaw chuck, which by means of a sleeve and a conical nut 30, connected to it in a manner fixed against relative rotation, has adjustable chuck jaws 32, between which the shaft of a tool can be fastened. A base body 33 of the tool holder 12 is screwed onto a threaded peg 34 of the drill spindle 13 with strong initial tension via a thread 35, so that the tool holder 12 and the drill spindle 13, in the case of the impact drilling machine 10, are fixed to one another in a manner fixed against relative rotation.

The gear wheel 16 is rotationally coupled to the intermediate shaft 17, which is shown in section in Fig.

3, via a locking coupling 38. The locking coupling 38 has four claws 39a, b on the face end of the gear wheel 16, which protrude axially, parallel to one another. Inserted between the claws 39a, b is a disk 40, which has two radially protruding slaving elements 41. The slaving elements 41 are shaped such that the disk 40 is limitedly rotatable between adjacent claws 39a, b.

The disk 40, on its outer circumference adjacent to the slaving elements 41, has an approximately cylindrical basic shape, which then changes over, approximately in the middle between neighboring slaving elements 41, into a respective flat face 42. The disk 40 is surrounded by a locking ring 43, which is fixed in a manner fixed against relative rotation in a housing protrusion 44 of the machine housing 26 via radially protruding lugs 43a.

The locking ring 43 has a variable radial spacing from the disk 40. In the region of the slaving elements 41, only a slight motion play is available between the disk 40 and the locking ring 43. In the adjoining cylindrical region of the disk 40, a radial spacing between the disk 40 and the locking ring 43 is provided that is just enough to receive the claws 39a, b with slight motion play. In the region of the flat face 42, the radial spacing between the locking ring 43 and the disk 40 then increases. In this region, one cylindrical roller body 45 each is received with slight motion play, and its diameter exceeds the radial thickness of the claws 39a, b.

The claws 39a, b are variably long in the

circumferential direction; diagonally opposed pairs 39a and 39b each have the same length. The disk 40 is placed with geometric positive engagement and thus in a manner fixed against relative rotation on a bearing seat 25 of the intermediate shaft 17. This means that via the claws 39a, b and the slaving elements 41, a torque can always be transmitted to the intermediate shaft 17. In this case, the claws 39a, b act to transmit torque to the slaving elements 41, and the roller bodies 45, because of their tendency to stay where they are then come to rest before the respective adjacent claws 39a, b. The adjacent claws 39b, a then retain the roller bodies 45 in the region of the flat faces 42, so that an unhindered torque transmission is assured.

Upon a torque transmission in the reverse direction, originating at the tool holder, the slaving elements 41 each act to transmit torque to the claws 39a, b. Because of their tendency to stay where they are, the roller bodies 45 are then positively displaced in the direction of the torque- transmitting claws 39a, b and are then firmly clamped between the locking ring 43 and the disk 40. As a result, the disk 40 is automatically locked in a manner solid with the housing. Because of the locking, it is then possible when fastening and releasing a tool in and from the tool holder 12, or when the tool holder 12 is screwed onto and unscrewed from the drill spindle 13, to exert a contrary torque on the drill spindle, without having to trip a locking device by hand.

Claims

1. A hand-guided drilling or impact drilling machine, having a machine housing (26), having a drive motor (11) for driving a drill spindle (13) to rotate, having a tool holder (12) embodied as a drill chuck and screwed to the drill spindle (13) via a thread (35), wherein upon changing the tool or replacing the tool holder (12) the drill spindle (13) absorbs a loosening and tightening torque and can be coupled in a manner fixed against relative rotation with regard to the machine housing (26) by means of a locking device (38), characterized in that the locking device (38) is disposed between the drill spindle (13), or an intermediate shaft (17) rotationally connected to it, and the machine housing (26), or a component (44) connected to it; and that the locking device (38) opens automatically upon a torque transmission from the drive motor (11) to the tool and blocks automatically upon a torque transmission from the tool holder (12) in the reverse direction.

2. The drilling or impact drilling machine of claim 1, characterized in that the locking coupling (38) is embodied as a claw coupling, which has claws (39a, b) that are disposed on the face end on a gear wheel (16) and each extend, parallel to one another, in the axial direction.

3. The drilling or impact drilling machine of claim 2, characterized in that the locking coupling (38) is disposed on an intermediate shaft (17), which can be coupled to the drill spindle (13) via at least one gear

stage (18/20 or 19/21).

4. The drilling or impact drilling machine of claim 3, characterized in that the at least one gear stage (18/20 or 19/21) has a negative gear ratio from the intermediate shaft (17) to the drill spindle (13).

5. The drilling or impact drilling machine of claim 3 or 4, characterized in that the locking coupling (38) has a disk (40), onto which slaving elements (41) for torque transmission are formed, protruding radially, and the disk (40) is disposed in a manner fixed against relative rotation on a bearing seat (25) of the intermediate shaft (17).

6. The drilling or impact drilling machine of claim 5, characterized in that the intermediate shaft (17), in the region of the bearing seat (25), has a cross section that deviates from a cylindrical shape, for forming a geometric positive engagement with the disk (40).

7. The drilling or impact drilling machine of claim 5, characterized in that the disk (40) and the gear wheel (16) are supported on the intermediate shaft (17).

HAND-GUIDED DRILLING OR IMPACT DRILLING MACHINE

Abstract

A hand-guided drilling or impact drilling machine is proposed, which has a machine housing (26), a drive motor (11), and a tool holder (12). The tool holder (12), embodied as a drill chuck, is connected to a drill spindle (13) in such a way that upon a tool change or upon replacement of the tool holder (12), a loosening and tightening torque is transmitted to the drill spindle (13). The manual machine tool has a locking device (38), by means of which the drill spindle (13) can be fixed automatically relative to the housing (26) upon a torque transmission from the tool holder (12) the drill spindle (13).

(Fig. 2)